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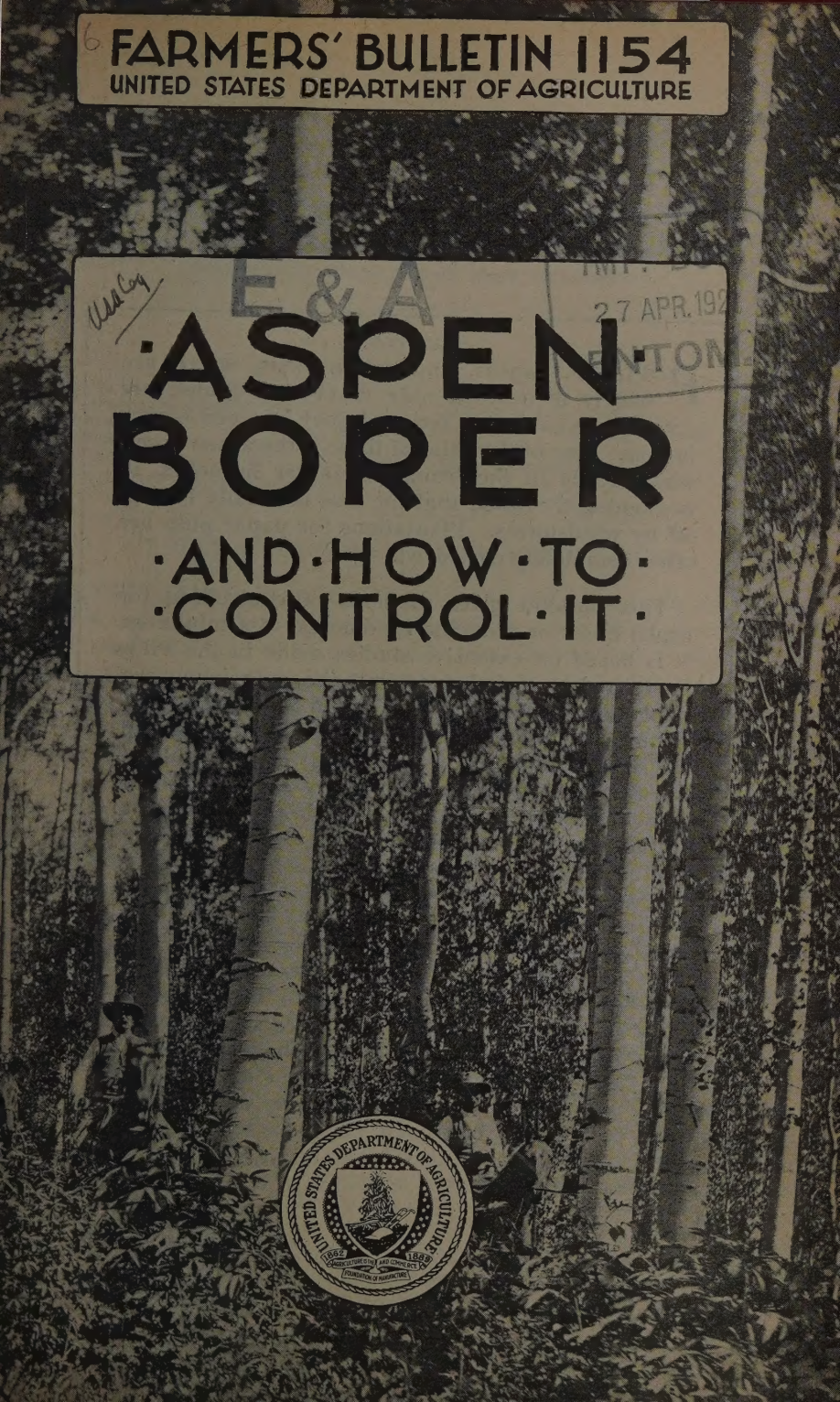
ASPEN BORER

AND HOW TO CONTROL IT



POPLARS, aspens, and cottonwoods, which are widely distributed over the United States, are everywhere subject to serious injury by wood-boring insects. One of the chief of these is the aspen borer, which feeds in the trunks or larger branches, so weakening the wood that the tree is readily broken off by windstorms. Plantations for paper pulp are often completely destroyed.

This bulletin gives methods of controlling the aspen borer or reducing its damage to a minimum. It is based on extensive studies made in the Pikes Peak region of Colorado, but the data in general apply to all regions of the United States where the poplars are native. The introduced Lombardy poplar is very seldom injured, but the commercial cottonwood of the Mississippi Valley seems to be the only native species of poplar which is at all immune to the attack of this insect.

Contribution from the Bureau of Entomology
L. O. HOWARD, Chief
Washington, D. C. October, 1920

THE ASPEN BORER[1] AND HOW TO CONTROL IT.

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TREES ATTACKED BY THE ASPEN BORER.

EXTENSIVE deadenings in aspen trees, due primarily to the work of larvæ of woodboring beetles, occur throughout the Pikes Peak region of Colorado. The most common and widely distributed insect causing this injury is the aspen borer;[1] but at higher elevations and attacking only the base of the tree another roundheaded borer[2] plays an important part, causing a large percentage of windfalls.

Aspen shade trees are equally susceptible to injury by the aspen borer and are frequently killed or so riddled that they break off in the wind.

Among the native or introduced species of poplars[3] growing in this region none is immune from the ravages of the borer. A very large percentage of the various species of poplar in Colorado Springs, Colo., and adjacent city parks, together with those in the forests of this region, are affected by this insect.

The heartwood of trees which are repeatedly attacked becomes honeycombed, causing dead limbs and tops which are easily broken off by the wind, finally resulting in the death of the trees.

Aspen and poplars generally are looked upon as short-lived trees. This is true in a measure, but on Cheyenne Mountain, in Colorado, at an elevation of 9,000 feet, the writer recorded over 75 aspen trees, growing in mixture with Douglas fir and Engelmann spruce, that had attained a size of from 15 to 23 inches in diameter and from 70 to

[1] *Saperda calcarata* Say.

[2] *Xylotrechus obliteratus* Lec.

[3] *Populus deltoides* (common cottonwood); *P. angustifolia* (narrowleaf cottonwood); *P. acuminata* (lanceleaf cottonwood); *P. fremontii* (Fremont cottonwood); *P. occidentalis* (western cottonwood); *P. nigra* var. *italica* (Lombardy poplar).

100 feet in height, with clean, sound trunks without a limb for 50 feet. These trees are from 65 to 100 years of age. (Figs. 1 and 2.)

The common aspen [4] comes up from seed scattered broadcast by the wind, and is an exceedingly valuable cover for watersheds and areas devastated by fire. It acts as a nurse to conifers which succeed it. The wood is used for fruit boxes, fence posts, and poles, and, when sound and free from insect work, for props and cribbing in coal mines. Of late years it is being used to a great extent for cabins and summer homes. (Fig. 3.)

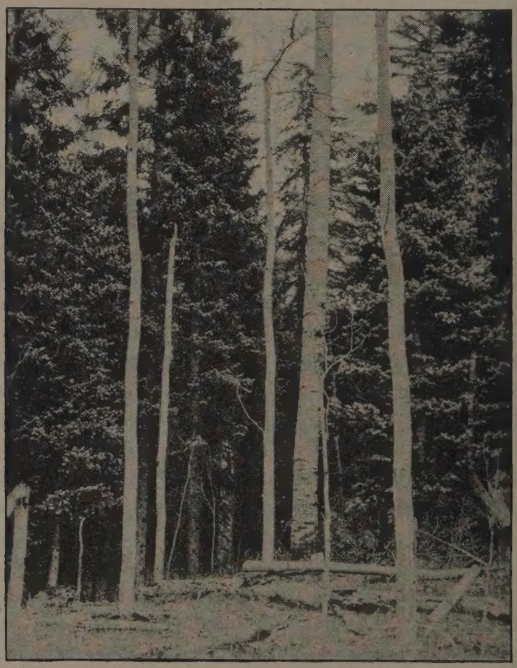


FIG 1.—Aspen growing in mixture with Douglas fir and Engelmann spruce, on Cheyenne Mountain, Colo., at an elevation of 9,000 feet.

The wood of the poplars is one of the materials used for pulp making. The trees are largely planted for shade and ornament, for windbreaks, and to hold the banks of streams.

CHARACTER AND EXTENT OF INJURIES.

The primary work of the aspen borer begins with an oblong scar made by the adult in the bark of living, healthy, and injured trees, in which the eggs are deposited, as shown in figure 4. The tiny grub or larva on hatching from the egg at once begins its destructive work by feeding and mining between the bark and wood, in which it re-

[4] *Populus tremuloides.*

mains for from 90 to 100 days. It then enters the sap and heartwood, where it excavates an oval-shaped longitudinal gallery 6 to 14 inches in length, as shown in figure 5.

The egg scars, whether the eggs hatch or not, are favorite places for entrance of other wood-boring insects and for fungi which hasten the death of such trees.

Throughout the forests of the Pikes Peak region many trees have died during the last 25 years. The old standing dead trees and those

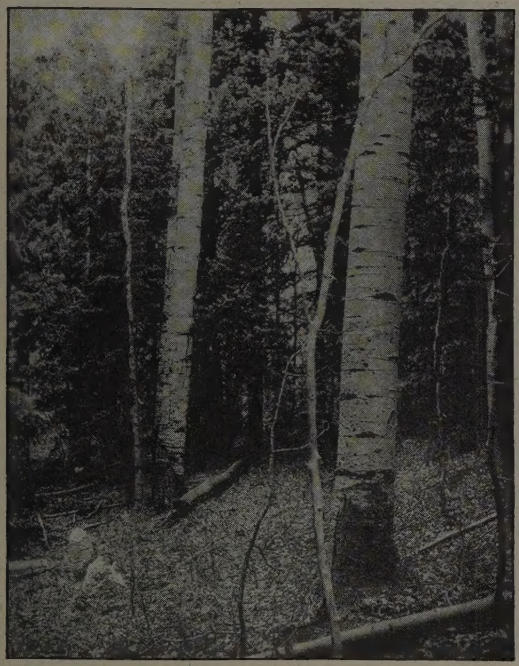


FIG. 2.—On Cheyenne Mountain, Colo., aspen which have attained a size of from 15 to 23 inches in diameter and from 70 to 100 feet in height.

which have fallen bear evidence of the primary attack of the aspen borer in the conspicuous large scars, exit holes, and deformed trunks. (Fig. 6.)

In some localities the standing dead, fallen, and dying trees exceed 50 per cent of the total stand. A count made on an area of about 2 acres near Wade, on Cheyenne Mountain, Colo., in an even-aged stand of aspen gives the following figures:

Total number of trees	667
Number of living trees	260
Number of dying trees	34
Number of dead trees	340
Number of infested trees	33

Deformed trees, 40 per cent of total.

Trees of from 2 inches up to the largest diameter are attacked by this borer. The large trees are frequently attacked close to the limbs, while smaller trees are attacked from the base up.

One of the characteristic features of the injury caused by this insect is that it is concentrated on trees that have been previously injured. In every clump of aspens trees heavily infested, or what may be called "brood trees," can be found. This feature tends to limit the destruction by this borer by confining it to such trees, and at the

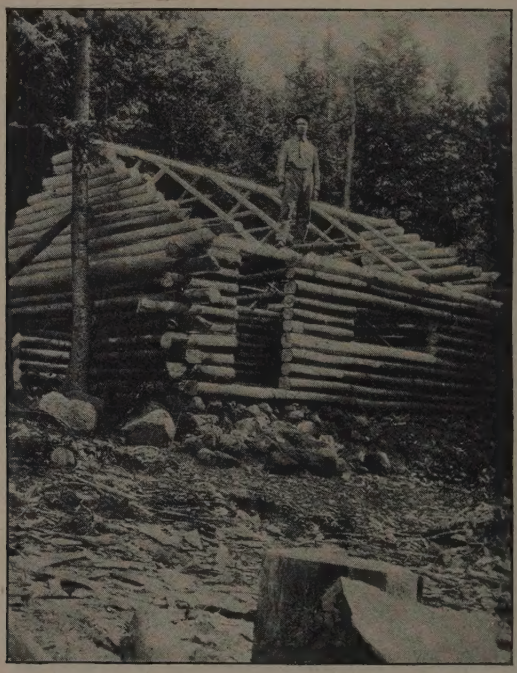


FIG. 3.—A summer home on Cheyenne Mountain, Colo., being constructed from aspen logs. These trees were cut within a radius of 200 yards of the structure. Elevation at this point, 9,000 feet.

same time it destroys many of the insects, in that these brood trees are frequently broken off by the wind or attacked by a fungus and a large percentage of the borers within fail to mature.

One of the chief causes of the rapid deterioration and death of trees attacked by this insect is a wood rot[5] or fungus which follows the work of the borer and destroys the heartwood. Following the opening made through the bark this fungus rapidly penetrates and destroys the heartwood, and so weakens the tree that it is broken off by the wind. The development of this disease is often so rapid that it envelops and destroys the borer larva before it matures.

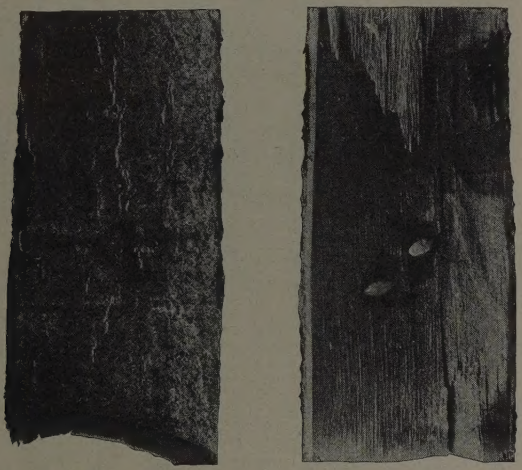
[5] *Fomes igniarius.*

DISTRIBUTION.

The aspen borer is found in all parts of the country, its distribution coinciding with that of the poplar.

SEASONAL HISTORY AND HABITS.

Normally this species has but one generation in three years. During the latter part of July and during August the adult female beetle gnaws in the bark an oblong scar, which slopes toward the center, penetrating the cambium or inner bark of the tree. Beneath the bark in this scar she deposits one or two eggs (fig. 4), which hatch into larvæ or grubs in from 20 to 25 days. Upon hatching, the young



a *b*

FIG. 4.—Aspen borer: *a*, Egg scar on living aspen trunk; *b*, bark removed to show eggs.

larva mines beneath the bark, remaining there over winter, and entering the sapwood and heartwood the following spring, where it is active until May or June of the second year following the egg laying. During this time the gallery is enlarged and an opening is maintained through the bark at the place where the egg was laid, and through this boring dust is expelled during the feeding period of the larva. The accumulation of these piles of fibrous frass at the base of the trees is one of the most characteristic features indicating the presence of the borer. On reaching full growth the grub (fig. 7) excavates the pupal cell near the lower end of the larval mine and remains inactive in this cell (fig. 5) until the following spring. It then pupates and remains as a pupa (fig. 8) 25 to 30 days before transforming to the adult. During the latter part of July[6] or during August of the third year the adult emerges through the hole which the larva used for expelling the frass.

[6] In the eastern United States, at an elevation of 500 feet, the beetles emerge from four to six weeks earlier.—F. C. C.

DESCRIPTION.

The adult (fig. 9) is an elongate, robust, grayish-green beetle, measuring from 21 to 30 mm. (about an inch) in length, and having faint yellowish spots on the wing covers. The antennæ or horns are very long, those of the female being about the length of the body, and those of the male even longer.

The larva is an elongate, cylindrical, footless grub of a whitish or yellowish white color. When full grown it measures from 30 to 35 mm. (about $1\frac{1}{4}$ inches) in length. It can be distinguished from all

FIG. 5.—Split sections of aspens showing larval mines and pupal cells of the aspen borer, and the character of the frass. The smaller holes on the bark section are exudation pores from which frass is expelled by the larvæ.

other wood borers in the trunk or large branches of poplars by the fact that it has the sides of the head parallel and the upper and lower surfaces of the body covered with fine horny points. On the first segment above, these are larger and curve backward. Two dark oblique lines are present on this segment in related species of poplar borers, but never on this insect.

The pupa, or intermediate stage between the larva and adult, has the same general form as the adult, but with its wings and legs folded along the side of the body. It is of a whitish color and the upper surface is provided with small horny spines.

NATURAL ENEMIES.

A tiny, wasplike, four-winged parasite which attacks the eggs of the borer has been reared and found very destructive to them.

Counts made on several areas show an average of about 25 per cent of the borer eggs destroyed by this insect.

Two-winged flies parasitic on the borer grubs were found to destroy 5 per cent of them; predacious insects and birds, less than 1 per cent. Fungous disease destroys 2 per cent of the mature larvæ, pupæ, and immature adults. The total annual mortality of the borer from these causes is from 30 to 38 per cent.

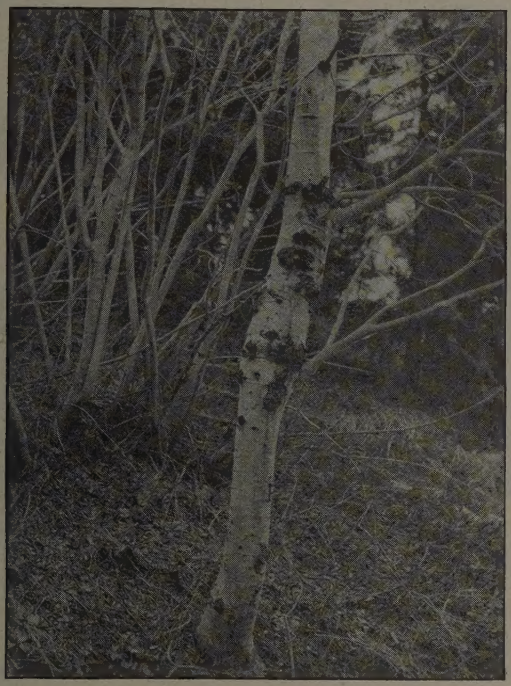


FIG. 6.—Living aspen, Cheyenne Mountain, Colo., altitude 7,000 feet. This tree is infested by 2 and 3 year old larvæ of the aspen borer. The swelling on the main trunk are the result of the work of these larvæ.

ASSOCIATED INSECTS AND DISEASE.

Generally associated with the injury of the aspen borer, there are the following insects and a fungous disease which more or less hasten the deterioration of the trees.

The bronze birch borer[7] attacks healthy, injured, and dying trees; it precedes and follows the attack of the aspen borer and may cause the death of the tree.

A flat-headed borer[8] deposits its eggs in the egg scars of the aspen borer, and in ax marks and bruises, and extends the damage in the heartwood.

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[7] *Agrilus anxius* Gory. [8] *Poecilonota cyanipes* Say.

Another flat-headed borer[9] attacks injured and dying trees. It deposits eggs in old egg scars made by the aspen borer and in other injuries, and it bores into the heartwood.

A large moth[10] which attacks the poplar and deposits its eggs in the borer egg scars is most frequently found in trees infested by poplar borers. Its altitudinal range is the same as that of the borer, none having been found above 9,000 feet.

A pinhole borer[11] attacks injured and dying trees in which the sap has begun to sour. It follows the attack of the aspen borer and is found also in trees otherwise injured.

FIG. 7.—Side view of larva of the aspen borer.

FIG. 8.—Side view of pupa of the aspen borer.

FIG. 9.—Aspen borer: Adult female, from side and from above.

A roundheaded borer[12] which occurs at higher altitudes than the poplar borer is the chief depredator in the aspen. Large areas have been denuded as the result of its work.

A heart rot,[13] causing much deterioration and decay in aspen, follows the attack of the aspen borer and other wood-boring insects, gaining entrance through the wounds made by them. It is present in nearly all trees attacked by the aspen borer.

CONDITION OF TREES ATTACKED.

Living, healthy, and injured trees are attacked by the aspen borer. Dead trees are never attacked. A strong preference is shown for trees which have partially succumbed to former attacks.

[9] *Dicerca prolongata* Lec.
[10] *Cossus* sp.
[11] *Xyloterus* sp.
[12] *Xylotrechus obliteratus* Lec.
[13] *Fomes igniarius.*

SITUATION AND CONDITIONS FAVORABLE FOR ATTACK.

Trees on dry, rocky slopes appear to be more subject to attack than those on less exposed situations. Along the low, moist creek beds and mountain meadows the attack is not as severe as on drier slopes.

Infestation is most prevalent between altitudes of 6,500 and 8,000 feet. It has not been found to occur above 9,000 feet.[14]

CONTROL MEASURES.

Control experiments carried on from 1914 to 1917 in various localities and upon various clumps of aspen have shown that two methods are practicable and that the insect can be controlled if not entirely eliminated by either of them. The two methods recommended are the cutting of "brood trees" and the application of creosote or carbolineum.

"Brood trees" are those which are attacked for a number of years in succession and contain two or more generations of the aspen borer. These so-called "brood trees" can be readily distinguished from the healthy trees and those injured by other causes by the deformed main trunks, dead tops, limbs, and the brownish liquid and frass exuding from the egg scars during May and June each year, at which time the larvæ are active, extending and enlarging their galleries. As aspen usually grows in clumps, the main centers of infestation can be readily located.

First, locate a clump of aspen and determine the extent of the infestation, then with a sharp ax cut down the "brood trees." These can be laid in compact piles and burned or the main trunks split and exposed to the sun, which will dry out the wood enough to kill the brood. One man with a sharp ax can cut and treat 50 or more of these trees in a working day, as aspen as a rule is of small diameter.

Where it is essential or desirable to preserve the trees, the painting of the egg scars with carbolineum has proved a successful method of control, though not as effective or practicable in large and remote forested areas. On private lands and city parks, where poplars are valued for their shade and ornament, this remedy can be used to advantage.

Creosote should be applied to the egg scars with a 2-inch brush. It is important that this work be done thoroughly. October is the time to apply the creosote, after the adult beetles have deposited their eggs and most of these have hatched into tiny larvæ or borers.

[14] In some sections of the country injury occurs down to sea level.—F. C. C.

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